Cervical Disc Injury

Symptoms and Conservative Treatment

F. W. GORHAM, M.D., *Santa Ana*

■ *Primary traumatic cervical disc disease and chronic disc disease associated with spondylitis aggravated by injury causes referred pain to the head, face, neck, arms, shoulders and chest, and even in the low back. Such pain may be reproduced by the injection of contrast medium for cervical discography. Dorsal nerve root pain is rare.*

Clear-cut disc derangement or annular incompetence may be demonstrated by discography at levels which reproduce symptoms. The pain pattern at each level is not consistent.

Conservative treatment, involving primarily the use of a cervical extension collar, results in substantial improvement in 75 per cent of cases.

THE INCREASING NUMBER of hit-from-behind automobile accidents has provided an excellent opportunity to observe a large number of cervical injuries. Most of the cases in the series of 368 that are the basis of this report were dealt with by the author, although the series includes others in which treatment was given at Doctors Hospital, Santa Ana.

Most cervical injuries of the kind here discussed result from automobile accidents although they may occur through the lifting of heavy objects, prolonged repetitive movements of the head, neck and arms, and occasionally hyper-extension during anesthesial intubation (Fender[6]). Studies of Severy[13] are pertinent; a collision when the offending car is moving at so slow a rate as seven miles an hour may cause serious damage and injury. The forces as described by him (Figure 1) have been supplemented by a stress analysis prepared by this author, in a situation resulting from a blow to the vertex of the skull with the patient in an upright position. The importance of this latter type of force has been neglected heretofore, but increasing interest is being shown in the frequency of cervical disc injuries following blows to the head. Two patients in the present series had evidence of disc derangement at all levels and clinically matched the postmortem findings described by Rabinovitch in 1957.[12] Rabinovitch suggests that this condition may represent a previously undescribed systemic disease of unknown cause involving the fibro-cartilage.

Repeated observations on patients with symptoms following neck injuries suggested that the results of classical neurological diagnostic and

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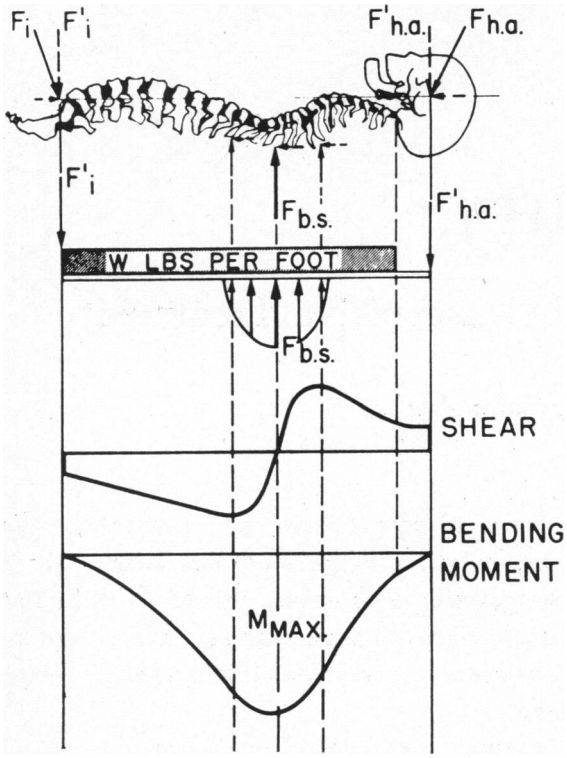

Figure 1.—(Fbs=Fulcrum back support. Fi, F'i, F'h.a., Fh.a.=transverse force components.) The spine must be considered as a single organ and all its components are affected by forces applied at any point throughout its length. Disc failure in the neck is more common than in the lower back with auto collisions because the same forces are concentrated in a smaller vertebra. (Author's interpretation from Severy,[13] with permission.)

therapeutic procedures were inadequate. Taken together, a number of observations strengthen suspicion that some etiological factor is being overlooked. Perplexing in this regard is the pattern of symptoms reported individually by a large number of patients, failure to disclose pathological change by myelographic or electromyelographic examination, failure to respond to symptomatic treatment.

Immediate Symptoms

Cord concussion causing temporary quadriplegia without loss of consciousness may only be explained by distortion of the cervical cord during extremes of movement of the cervical spine. Scrutiny of motion pictures of blows to the jaw in boxing matches confirms the possibility of this distortion. Usually after such damage, use of limbs is regained over a period of an hour or more. This complication has been seen by me six times.

Other immediate symptoms may occur within the first 12 hours following the accident, and are separated from the delayed symptoms by a period of improvement, or perhaps an apparent recovery. Commonest of these is giddiness which is usually likened by the patient to a feeling of uncertainty about his environment. Rarely does true vertigo occur. This giddiness is aggravated by head and neck movement. Pain occurs next most frequently and is localized to the neck, usually the back of the neck. This pain is sharp and may be reproduced by the patient in his palpation of the neck. Distant pain to the chest, arm, hand or between the shoulders is sharp and sudden and quickly disappears.

Unfortunately, there may be no immediate symptoms or they may be masked by the pain of other injuries and not remembered by the patient.

Delayed Symptoms

Different kinds of pain occur usually from 12 to 24 hours after the original injury. The onset of pain may be gradual and may not reach maximum until a month or two has elapsed. Sometimes the pain is vague and difficult to localize, and it may be continuous or intermittent. Headache is the most common type of pain, occurring in over 90 per cent of patients. It is initially reported to be retro-orbital, frontal or at the vertex, bilateral or unilateral. It extends into the nape of the neck and into the shoulder. Frequently it is associated with visual blurring or even scintillating scotomata. Onset usually extends over part of an hour but may be very sudden. At lower levels the pain extends to the face and jaws, ears and chest, sometimes bilaterally. Pain in the shoulders, arms and hands is pseudo root-like in distribution, but always manifests with some inconsistency in its margin; frequently only an unexpected finger is involved. Interscapular pain has been reproduced at surgical operation in the awake patient (Cloward[2]). Backache and coccygeal pain occur and may be related to dural irritation.

Pains frequently persist for months following injury. They are aggravated by activities which involve movement of head on the neck or movements of the shoulders. Symonds[17] noted: "The patient also complains that he gets a headache when he exerts himself, or when he is tired or bothered; stooping makes him giddy; he does not sleep as well as he should; he has lost confidence, power of concentration and is depressed."

Observations on Examination

FINDINGS: Changes in muscular tone in the neck, ranging from midline fixation to splinting in extremes of rotation, flexion and extension are present. When assuming recumbency, the patient may clasp his head in his hands or complain that movements

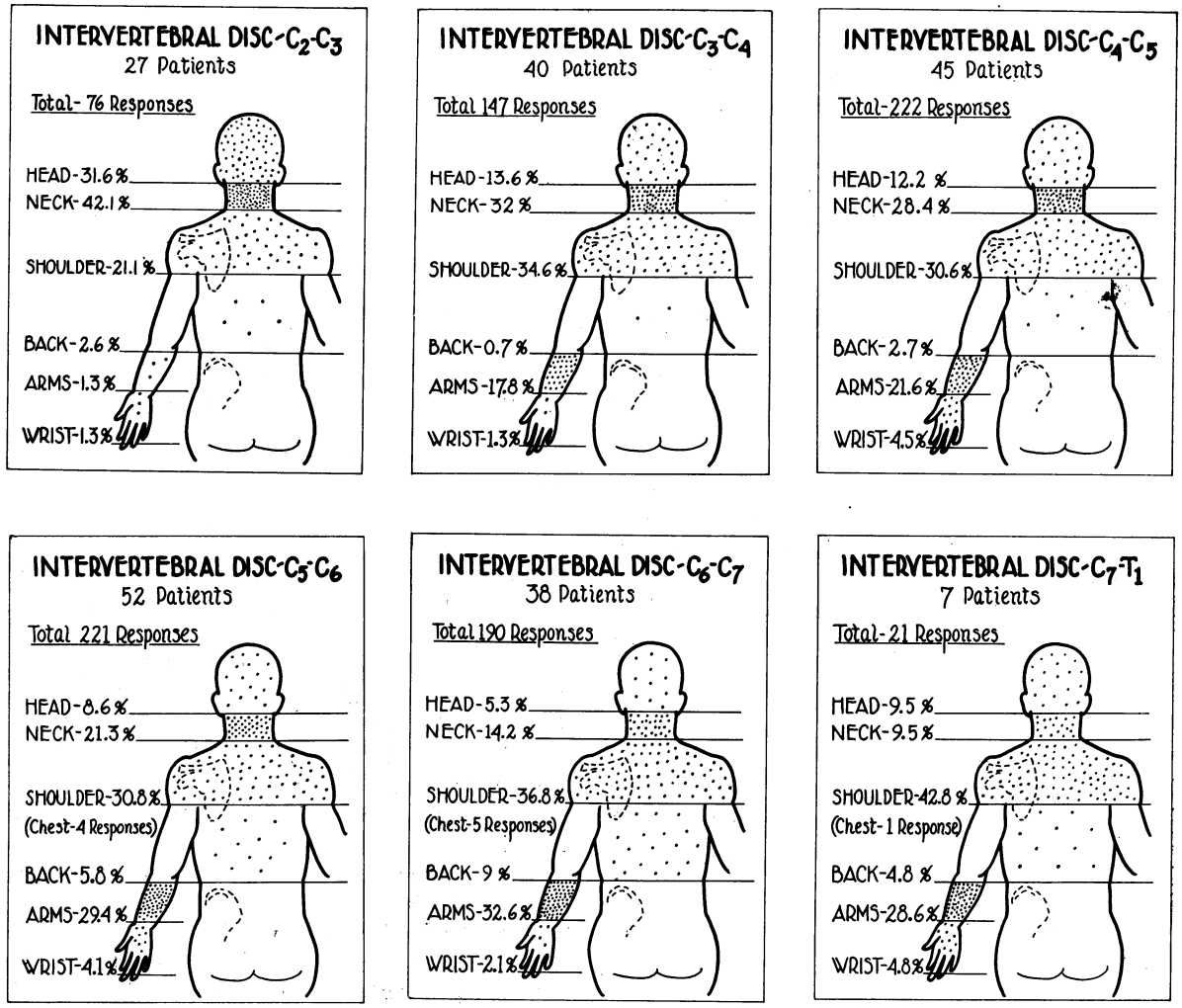

Figure 2.—Pain responses (related to injuries at various levels of the spine in the above drawing) in discography are not from dorsal root irritation. The purpose of discography is to pinpoint the most painful disc in anticipation of surgical operation or in association with therapeutic cortisone injection.

of head and neck result in electric shock-like sensations in the extremities. This was originally described by L'Hermitte[8] as pathognomonic of multiple sclerosis, but is probably evidence of irritation of sensory tracts by swelling of the cord or spinal canal narrowing.

Reflex Changes. The absence of abdominal reflexes is the most frequent finding; this sign is present about half of the time. Biceps, triceps and periosteal radial reflexes are altered. The asymmetry of the reflex findings has no regular relationship with the most painful side.

Motor Symptoms. Muscular weakness and atrophy occur with lateral protrusion of a disc impinging on a nerve root. This is not common. Paresis of the long thoracic nerve also occurs, but the reasons for this are not clear since the nerve supplying it receives a filament from three levels. In the cases in this series, disc abnormalities as radiographically observed did not coincide with these levels. Recovery seems to occur in all cases. Partial spastic hemiparesis below the distribution of the sixth cervical nerve has been seen twice, but not cord transection.

Sensory Symptoms. Pain has already been discussed. Vague and inconsistent hypesthesias also occur. The areas have indiscrete margins. Usually the hands and forearms are involved and the involvement may vary from examination to examination. This suggests hysteria; but it is also reminiscent of attempts to map out hypesthesia or paresthesia present in the abdominal wall in acute appendicitis or acute cholecystitis. Miscellaneous signs include tenderness on palpation of the most proximate cervical spinous process when the patient is prone with head resting on clenched fists. With

this local pain may come the referred head, arm, shoulder or back pain of which the patient complains. This is considered pathognomonic. Pulse obliteration is evidence of scalene spasm or hypertrophy. This may be primary or it may be secondary to splinting of an injured joint. Surgical section of the muscle sometimes is required for differentiation. Torticollis and roto-scoliosis have been observed. Their relationship to the injury is obscure and is being investigated.

Electroencephalographic response may be altered and psychiatric abnormalities are also common and unexplained. It is noteworthy that the reticular activating substance descends to the upper thoracic segments.

It was noted that pain reported by these patients was suggestive of that described experimentally by Lewis,[11] Campbell and Parsons[1] and Cloward.[2] Campbell and Parsons were dealing generally with stimulation of the periosteum, dura and intraspinous ligaments. More specific pain patterns seemed to occur when discs were distended with opaque material for discographic examination.

The pain responses observed in these circumstances in the present series are illustrated in Figure 2 and are noteworthy only for their lack of specificity. These responses are presumed to result from the stimulation of an injured disc by the contrast media. Normal discs absorb dye poorly, and usually the injection causes only local pain. Dublin[4] conjectured that injury probably destroys the continuity of the fibrous annulus which then transmits hydraulic pressure changes to the sensitive periphery of the disc.

The pathway for this pain in the spinal cord is obscure. It is important to note that it is not dependent on dorsal nerve root irritation; it lacks Sherrington's "vehement" characteristic. Rabinovitch[12] only occasionally found a ruptured disc pressing on the dorsal nerve root. My studies in this series confirmed this observation. Frequently the disc margins were well outlined by the contrast medium (Hypaque®), and were not proximate to the nerve root despite root-like pain. Lewis'[11] criteria for visceral pain seemed well confirmed in the cases I observed. Notochord vestiges carried in the discs may preserve the visceral innervation responsible. It has also been noted at myelography that occasionally the anterior root filaments are clearly outlined over a minimally bulging disc. They are not otherwise seen. This suggests the possibility of some pain being transmitted antidromically. I do not believe that this possibility is gainsaid by Frykholmb's work, as the phenomenon of "summation" has not been eliminated. The suggestion by Stewart[15] and Fay[5] that these pain pathways are primarily over the vertebral artery may have merit in occasional cases, but in the cases in the present series in which vertebral angiograms were made, no defect of the artery was observed. Patients who had evidence of vertebral artery impingment had clinical evidence of basilar artery insufficiency.

Myelography. Usually in the more recent cases in the series dorsal and cervical myelographic examinations were carried out before discography was done. The relative accuracy of these measures is shown in Table 1.

Discography. In myelography, credence was given to minimal transtable bulges or anterior-posterior defects which previously had been considered insignificant. Discography seems more demonstrative visually, and it aids further in that the process of injection reproduces or emphasizes the patient's symptoms. Discography is of no value in asymptomatic patients (Holt[9]) and is used chiefly in those cases in which the results of conservative treatment have not been adequate. It pinpoints the selection of the painful or most painful disc. An additional confirmation is received by the voluntarily reported relief noted when the pain from the injection of Hypaque® is relieved by procaine without the patient's knowledge of its use. As in the anamnesis, discretion was used in accepting the patient's voluntary remarks without the use of leading questions.

The criticism has been offered that symptoms and findings at discography are artefactual and caused by the introduction of the needle into the disc space. If a 20 gauge needle is used to perforate the disc, the criticism certainly may have merit. Never in the present series was a needle larger than 25 gauge used. In time, the examiner becomes well skilled in proper placement on the first attempt. In the present series, when perforation of the disc was not skillfully done (that is, there was either more than one perforation or the needle was placed too deep), less credence was given to the results of discography. This did not happen often, however.

Treatment

Therapeutic injection of procaine was ineffective in this series but local administrations of cortisone seemed to bring about temporary remission of symptoms. A cervical extension collar is an ancient remedy, but Symonds[17] recognized that the strict use of this device could alter pathological toe signs and perhaps indefinitely delay paraplegia in patients with spondylitis when operation could not be done. Symonds stressed the need for the rigidity of the collar and diligence in its use. A cervical contour pillow (Jackson[10]) and contour position (Soto-Hall[14]) are necessary during recumbency.

There is a difference of opinion concerning whether injuries of the kind under discussion are best treated by immobilization or by active physical therapy consisting of diathermy and cervical traction or manipulation. The experience of Crowe[3] is confirmed by my observation. It has been my experience that physical therapy results in aggravation of symptoms, eventually causing the patient to discontinue treatment. Admittedly, this observation is at variance with the reported experience in low-back disc disease, in which improvement occurs usually with increasing mobility.

Toleration of the cervical extension collar by the patient is best attained only by a gradual increase in use over a period of 10 days to two weeks and by the relief of symptoms. Once in awhile a slight exacerbation of symptoms occurs when the collar is first worn, but very rarely does this necessitate discontinuing its use. For patients using the collar, I usually restrict activities for six months and maintain intermittent examinations during that time. The collar is then gradually removed and activities gradually increased. If the patient's progress is satisfactory and the symptoms disappear, return of the patient to full duty is recommended. Conservative treatment as here described brings about substantial improvement in about 75 per cent of cases.

Should the removal of the collar be associated with a recurrence of symptoms, surgical consultation is obtained.

It is not within the scope of this paper to consider in detail the results of surgical treatment but insofar as those patients who have been operated upon turn to a neurologist for follow-up, it seems reasonable to present the subject from an internist's point of view. In the Orange County series, in 112 cases fused by modification of Cloward technique, the incidence of infection was approximately 7 per cent. In another series,[16] it has been reported to be only 0.05 per cent. In about 5 per cent of cases, operation resulted in pseudo-arthrosis. This author is impressed with the fact that if the fusion is complete and there is no phantom joint space remaining, the patients invariably do well. As in other surgical procedures, good results depend on careful and meticulous execution of a well designed surgical procedure. If the procedure is not carefully done, and a phantom joint space remains, pain often persists. When the fusion is solid and no remnants of the previous joint can be seen anteriorly, the result is usually excellent. Of 11 patients with posterior fusion, all remained disabled and in pain at last report.

TABLE 1.—*Myelographic Findings in 78 Patients with Abnormal Discogram*

	No.	*Per Cent*
Abnormal cervical myelogram	29	36
Normal cervical myelogram (but reported as showing)	49	63
Anterior-posterior defect—		
Transverse band	4	5
Blunted root sleeve	6	7
Crosstable defect—		
Indentation	28	36
No variation	11	14

1415 North Broadway, Santa Ana, California 92706.

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